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Worldwide Report

TELECOMMUNICATIONS POLICY,
RESEARCH AND DEVELOPMENT

No. 176



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19 August 1981

WORLDWIDE REPORT

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BRIEFS

'MONTSAME,' 'KPS' SIGN AGREEMENT--Ulaanbaatar, 21 Jul (MONTSAME)--An agreement on mutual cooperation between the Mongolian Information Agency MONTSAME and the Lao KHAOSAN PATHET LAO AGENCY was signed a few days ago in Vientiane. [Text] [OW030042 Ulaanbaatar MONTSAME in Russian 1445 GMT 31 Jul 81]

AFGHANISTAN, GDR TV AGREEMENT--A cooperation agreement between DRA Television and the State Television Committee in the GDR Council of Ministers was signed this morning in the DRA Ministry of Information and Culture. The agreement was signed from the DRA side by the director of broadcasting of DRA Television; and from the GDR side, the ambassador of that country in Kabul, Kraft Bumbel. Under the contract cooperation will be undertaken on television programs and technical personnel and experts will be exchanged between the two countries for a period of 2 years. [Text] [LD290110 Kabul Domestic Service in Pashto 1230 GMT 28 Jul 81 LD]

CYPRUS, USSR RADIO, TV AGREEMENT--Today President Kiprianou received a delegation from the Soviet State Radio and Television which is in Cyprus for talks with CBC [Cyprus Broadcasting Corporation] officials. The talks have resulted in an agreement which provides for an exchange of radio and television programs. The agreement was initialed by the director of CBC, Mr Khristofidhis, and the leader of the Soviet delegation, Mr Yevstaf'yev, a deputy minister and vice chairman of the Soviet State Radio and Television Committees [as heard]. The agreement will be formally signed during the forthcoming visit of President Kiprianou to Moscow this autumn. [Text] [NC111700 Nicosia Domestic Television Service in English 1545 GMT 11 Aug 81]

CSO: 5500/2283

INTER-ASIAN AFFAIRS

ASEAN TELECOMMUNICATION COOPERATION DISCUSSED

BK00003 Jakarta ANTARA in English 0805 GMT 8 Aug 81

[Text] Jakarta, 8 Aug (ANTARA)--The regional economic cooperation of the five-country ASEAN--Indonesia, Malaysia, Singapore, Thailand and the Philippines--will be strengthened with the proposed establishment of a regional telecommunication system.

The economic ministers of the 257 [million]-people region, at a meeting in Kuala Lumpur in 1977 stressed the importance of cooperation in telecommunications. They agreed to set up a regional telecommunication satellite and a submarine communication cable system.

At the fourth extraordinary meeting of countries using the service of International Satellite (Intelsat) in Manila early April in 1979 it was agreed that the second generation of the Indonesian Palapa telecommunication satellite will offer service to the five-member countries of ASEAN.

Indonesia plans to launch the second generation of Palapa in mid-1982, as the life span of the Palapa first generation will terminate by mid-1983.

The new satellite will have 24 transponders capable of reaching the 3,148,500 km region.

Late last May a memorandum was signed by the representatives of Indonesia and Singapore mentioning among other things that Palapa will be used to promote telecommunication links between the two countries and as a transmission medium for Singapore and other ASEAN countries in the event of other communication facilities are out of service.

With the signing of the memorandum all member countries have formally agreed to use the service of Palapa for telecommunication links and exchanges of television programs on ASEAN cultures before the 14th anniversary of the association which falls on August 8 (Saturday).

Palapa I with its 12 transponders has already served the five member countries. Their peoples have enjoyed ASEAN television program exchanged through the satellite.

With the Philippines, Indonesia made an agreement, similar to the one signed with Singapore, in Jakarta in June in 1978. The signing was on March 23 in 1979 with Thailand and with Malaysia it was on March 29 in 1979 all in Jakarta. [paragraph as received]

The agreements specify that 12 transponders of the 24-transponder Palapa II will be for use in Indonesia and 9 for the other four countries and the remaining 3 are for reserve.

All member countries of ASEAN will be linked with submarine cable systems. Establishment of the systems between Indonesia and Singapore was expected to be completed in 1980-81.

The systems constitute part of the ASEAN submarine cable networks linking the five member countries.

The links between Singapore and Malaysia, and Malaysia and Thailand were also scheduled to be completed in 1980-81, where as that between the Philippines and Thailand is scheduled for completion in 1982-83.

The submarine cable systems between the Philippines and Singapore were completed in September in 1978.

CSO: 5500/2283

DELHI-MOSCOW TROPOSCATTER LINK TO OPEN DOOR

Madras THE HINDU in English 15 Jul 81 p 7

[Text]

NEW DELHI, July 14

A direct troposcatter link between Delhi and Moscow is expected to be operational by early September this year. Installation of the equipment at the Indian terminal is almost complete and preliminary testing has commenced.

The existing telecommunication services between India and the Soviet Union are provided by using a high frequency radio link between Delhi and Moscow, supplemented by hardwired satellite circuits via London and Paris.

Recently, a direct satellite link was opened between Delhi and Moscow. Due to the technical and traffic limitations of these channels, a direct troposcatter link between the two countries was mooted in 1977. A protocol for providing a direct troposcatter communication link between Charar-e-Sharif near Srinagar and Dushanbe in Tashkent (USSR) was signed in May, 1977.

A troposcatter system works on the principle of refraction of the radio waves at the mountain tops. In this system, the radio waves will be directed towards mountain peaks of the Himalayas separating India from the USSR, which will act as knife-edges to bend a small portion of the resultant energy in the direction of the receiving terminal. Though short tropo links have been successfully tried, the Indo-USSR link will be one of the longest hops using this technology.

It was envisaged in this project that the radio equipment for both the

terminals will be supplied by the USSR, while the maintenance system would be supplied by India. The system would be initially provided for upto 12 voice grade channels and will be capable of expansion to 24 channels with increase of transmitter power.

The channels derived from this link will be connected to the New Delhi international switching centre. Via the national microwave link between Srinagar and New Delhi. Similar extensions would be done on the USSR side as well.

The estimated cost of the project for the Indian terminal which is located at Charar-e-Sharif, is Rs. 3.90 crores, with a foreign exchange component of Rs. 92 lakhs. The antennae systems at both the ends have been supplied by the Electronics Corporation of India (ECI).

The systems engineering and installation at the Indian terminal is being handled by Indian engineers and assistance from USSR engineers is being availed of for installation and testing of the equipment. The ECI engineers were associated with the commissioning of the antenna systems at Srinagar and Dushanbe.

The civil and associated works are in progress. The reserved UHF link connecting Charar-e-Sharif terminal to Srinagar has been supplied by the Indian Telephone Industries and is expected to be tested shortly—Our Special Correspondent.

TASK FORCE ON RURAL TELECOMMUNICATIONS REPORTS

Bombay THE TIMES OF INDIA in English 8 Jul 81 p 6

[Text]

NEW DELHI, July 7 (UPI):

A CHANGE in the present policy of providing telecommunication facilities in the rural areas, strictly on the basis of population, has been recommended by the task force of the Post and Telegraph department.

A majority of villages in several states will enter the category of population of villages is the sole criterion, according to the report of the task force submitted to the government recently. The task force was entrusted with the task of evolving a new strategy for the development of rural communication.

A long-distance public telephone is at present opened, without consideration of its remunerativeness, in a village with a population of 5,000 or more in developed areas, and 2,000 or more in backward, hilly or tribal areas.

In states like Himachal Pradesh, Madhya Pradesh, Orissa, Jammu and Kashmir, Assam, Rajasthan and Uttar Pradesh the report points out, there are not more than six per cent villages whose population exceeds 2,000. States like Bihar, Punjab and Karnataka have about eight per cent of this village in this category.

UNEQUAL SHARE

Even in advanced states like Maharashtra, West Bengal and Gujarat, only ten per cent of the villages have more than 2,000 inhabitants while the number of such villages ranges from 20 per cent in Andhra Pradesh to 10 per cent in Tamil Nadu. Kerala is the only state where 98 per cent of the villages have more than 2,000 residents.

Therefore, the report says, the present policy is likely to result in maldistribution. The share of more than half of the states, particularly HP,

J and K, Orissa, MP, Assam, Rajasthan and UP would be very low.

It would be more rational, the report says, to adopt population and distance-related criteria, than merely population, to meet the plan objective of providing access to a public telephone facility to an habitation within a reasonable distance.

The task force has recommended that the country should be divided into clusters of villages of five-km radius and public telephones provided on this spatial basis.

If this is adopted as the new policy, only about 47,000 public telephones will be needed to provide communication facilities within a five-km distance. Accessibility of a telephone within this distance should be attempted first and later on reduced progressively to four km, or less, depending on the demand.

As regards the charge for the rural telephone service, the task force is not in favour of adopting a differential tariff scheme as introduced by a neighbouring country. Under this scheme, the rental and trunk call rates are determined by the economic conditions of the region. An agricultural subscriber is charged less than an industrial or business subscriber,

Such a policy cannot be implemented in India as the means of production in rural areas are predominantly private-owned. Any classification on the basis of occupation or profession is likely to run into problems.

Therefore, the national trunk charging plan should be uniformly followed for the whole country, making no distinction on the basis of class of subscriber. Whatever subsidy may be required to encourage telephone usage in economically backward and underprivileged regions may be allowed in the fixed annual rental charge.

BRIEFS

APPLE SATELLITE COMMUNICATION--The communication channel aboard Apple has been successfully used by the space application center in Ahmedabad for relaying a radio program of All India Radio to the New Delhi earth station where it was recorded. A mission control spokesman at Sriharikota said the channel was used for a period of 1 hour and 50 minutes and the program reception was good and the recording went off smoothly. [Text] [BK310257 Delhi Domestic Service in English 1530 GMT 29 Jul 81 BK]

PLANS TO LAUNCH SATELLITES--The Indian Space Research Organization [ISRO] is planning to launch satellites like Bhaskar with payloads weighing between 600 to 700 into sun's synchronous orbit by 1985-86. This was stated by ISRO director Pro U. R. Rao in an interview with United News of India in Bombay. He said the ISRO is also planning to upgrade SLV-III launch vehicle for achieving a capability to launch 150 kg payloads. It will also develop a totally new vehicle in 2 or 3 years. He said the country will be able to launch its own communication satellites in a few years. [Text] [BK290915 Delhi Domestic Service in English 0830 GMT 29 Jul 81]

'APPLE' ATTITUDE SYSTEM--Advanced attitude control systems used in APPLE offer several advantages for better satellite communication facility, reports UNI. According to experts in Delhi, the three-axis body stabilization system developed recently allows complex antennas for better pointing accuracy towards the earth. Larger solar arrays can be oriented towards the sun. Higher frequencies can be used and the satellite's capacity can be better utilized. The beams can become more directional and they would permit closer satellite spacing. Far from being passive repeaters of microwaves in the sky, satellites can become switch boards in orbit which can provide better links to terminals on land as well as on board ships. The latest Intelsat-5 satellite over the Atlantic Ocean has the new attitude control system, which is a sophisticated method of stabilising the spacecraft. It needs momentum wheels. Such wheels have been perfected in India. [Text] [New Delhi PATRIOT in English 9 Jul 81 p 5]

CSO: 5500/7151

BRIEFS

ACCESS TO AIRBORNE SCANNER--Technology that allows scientists to "spy out" fish shoals, crop and forest diseases, and storm and fire damage from heights ranging between six and 900 kilometres will be highlighted at a ceremony tomorrow. Involved are the Minister of Science and Technology, Dr Shearer, and IBM (New Zealand) limited, who will sign a document clearing the way a second joint agreement between IBM and four government departments for research into data gathered by airborne scanners on New Zealand's land and sea resources. [as published] Under the agreement the Department of Scientific and Industrial Research, the Ministry of Agriculture and Fisheries, the Forest Service, and the Lands and Survey Department will have access to a Sydney-based computer system called Erman. This will analyse the information collected as the result of airborne sweeps at six kilometres over selected areas of the country using a sophisticated American scanner or remote sensor. [Text] [Wellington THE EVENING POST in English 8 Jul 81 p 40]

CSO: 5500/9016

CAUSES FOR FREQUENT BREAKDOWN IN TELECOMMUNICATIONS CITED

Sofia IMPULS in Bulgarian 16 Jun 81 p 3

[Text] Almost daily, the bulletins about the conditions of the telecommunications system cite facts of breakdowns of the intercity and intracity telephone and telegraph communications caused by power outages.

Other causes cited are out of order generators, out of order automatic system of generators, shortage of fuel for the generator, absence of a technician to switch it on, even, absence of a generator and many other "valid" causes which are not being fought against persistently.

We work to the new economic mechanism, improve the work brigades' organization, every year we put a number of new projects into exemplary condition and improve our training, and still breakdowns in power equipment are considered as an "irresistible force" behind which organizational weaknesses, negligence in supply, oversight in planning, etc. hide.

Power outages and breakdowns of the regular and back-up power providing equipments have occurred in the past, occur now, and will occur in the future. However, there should be a trend to decrease them in number as well as in duration, despite the constant growth in the quantity of such equipments. On the other hand, the decrease will remain wishful thinking and there will be no change in the situation as long as the personnel immediately exploiting and maintaining the power equipment and installations and the chiefs of the okrugs' telecommunication managements do not pay the necessary attention and care to the problem, because most of the breakdowns, for example in Stara Zagora, are the result of indifference. And breakdowns caused by power outages occur in many okrugs. In recent years, leading okrugs by this negative index were Sofia, Pleven, Mikhailovgrad and Pernik, but recently they have been closely followed by Burgas, Shumen and Yambol, and, finally, for several months now Stara Zagora has been the champion.

A careful analysis of the actual causes reveals curious facts:

- a) Irregular deliveries of liquid fuels and oils to district and subdistrict stations;
- b) Irregular control of power equipment conditions in some places;

- c) Occasional inadequacy of liquid fuel tanks which do not meet the requirements;
- d) Despite repeated instructions requiring creation of okrug service stations for telephone and telegraph power supply and organization of annual refresher courses for the local personnel, most of the okrugs have not completely fulfilled these instructions;
- e) The order and delivery of spare parts on time is not secured;
- f) The OUS [Okrug Management of Communications] do not keep track of their orders in PSO [Industrial Supply Organization] "MTS" [Machine-Tractor Station] and they do not know what part of their orders has been accepted, when they could expect the delivery and what should be reordered;
- g) The installation rooms for the expected power equipment are not prepared;
- h) The cooperation of the local power authorities is not sought. Neither is the assistance of higher local organs (city and okrug BCP committees) for the improvement of the quality of power supply to ptt (posts, telegraphs, telephones) in a given city or ptt stations in the district;
- i) The power supply work groups in some okrugs are not given priority use of vehicles for prophylactic check-ups of the equipment;
- j) OUS [Okrug Management of Communications] does not keep a record of the time spent for repairs and the quality of the repair jobs. They do not take into consideration the contribution made by the people working in the power supply for the fulfillment of the plan and for reaching high-quality indices;
- k) Very rarely does the management of OUS [Okrug Management of Communications] familiarize itself on the spot with the circumstances under which a breakdown has occurred, with the work conditions in the power supply, with the needs of the personnel etc;
- l) At some places not enough attention is paid to keeping and preserving the plans and instructions for power equipments and installations, neither are all changes reflected in them;
- m) Precautionary checkups and technical inspections of diesel generators are not scheduled and carried out on time;
- n) The condition of the grounding installation is not checked even once a year;
- o) The conditions of the batteries are not regularly inspected, and the supply and installation of new batteries is not done on time.

There are many more weaknesses.

There is one problem in power supply which is not directly related to the breakdowns, but strongly affects personnel fluidity. It is the attitude towards the nature and conditions of the job. Looked at from a distance, power supply is a

simple matter: a rectifier, battery, diesel generator and control panel. That is why people view and care for power supply as if it were something very simple. The personnel is exclusively male, which is something very rare for the communications field. The job of maintenance of equipment and installation is one of the least attractive. It involves acid fumes, gas, fuel, oil, humidity, dust, noise, vibrations, artificial light, high temperature, draughts, hauling of heavy objects, soiling of body and clothing, it requires frequent trips to all stations in the okrug which have ATTs [dial telephone exchanges] and duties after regular working hours and during weekends. For continuous work under the influence of any of the above-mentioned harmful substances extraremuneration and compensations are given. However, in power supply jobs neither extraremuneration, nor any other compensation, like a shorter working day or extra paid leave, is stipulated, despite the fact that work in consecutive harmful conditions amounts to work in a complex of harmful conditions. Probably that is why not a single woman has chosen power supply as a profession.

It is a well-known fact that all power-supply plants in this country are equipped with rectifiers made in Bulgaria, the USSR, GDR, FRG, France, Italy and Norway and are built to different designs and have a high use of electronics—a total of 50 kinds; batteries produced in the same countries, including stationary, power and starter batteries—a total of over 60 kinds; gas and diesel generators made in Bulgaria, the USSR, GDR, CSSR and Poland equipped with complex automatic and other auxiliary devices—a total of 30 different kinds; converters, motor generators, invertors and other electrical converting devices, or a total of 160 different kinds of equipment made in 40 factories in 9 countries. The maintenance of this equipment requires a solid base of knowledge and high-level training.

Because of the frequent power outages, the stand-by power equipment, batteries and diesel generators are activated very often. This leads to a great increase in the number of switches from regular to stand-by equipment and vice versa, which in its way leads to more frequent breakdowns of the equipment. The volume, complexity and responsibility of the personnel's work has increased many times. Now a power outage, even in a small station like Belchia Banya, Kaspichan, etc. disorganizes the operation of a considerable part of the communication system. This is another fact which underscores the importance of these problems. There is not an okrug in the country with fewer than 20 village ATTs [dial telephone exchanges], and in okrugs like Plovdiv and Veliko Turnovo there are at least 70-80. Some leaders, as in Vidin, Parnik and others, believe that one man can maintain the power plants, others, as in Mikhailovgrad, believe that there is not enough work in power supply and that there should be cuts in the personnel. Nearly half of the OUC [Okrug Management of Communication] have not provided service vehicles to their all power teams. It is not surprising then that in these okrugs there are numerous and lengthy breakdowns. And why are breakdowns caused by personal faults not penalized by the managers?

The conclusion is that what is being done now in the okrugs to forestall and diminish the power outages is insufficient. OUC [Okrug Management of Communication] managers and the public organizations, which are responsible too, should visit the all power team, participate in the discussions and in the solving of the existing problems. At least once a year they should join the team inspecting the plants in the okrug. This practice will help them to know the problems and to solve them in a timely and effective manner.

The assistant technical managers should, at least once a year, visit some of the neighboring okrugs and get acquainted on the spot with the power-supply organization. This will give them the opportunity to exchange experience and to achieve an overall improvement in the work.

The number and duration of the power outages are a specific mirror for the telecommunication conditions in the okrug. Let us work in such a way that only good things are reflected in it.

9804

CSO: 5500/3020

INTER-AMERICAN AFFAIRS

BRIEFS

BOLIVIA-ARGENTINA MICROWAVE LINK--La Paz, 14 Jul (TELAM)--According to the Bolivian National Telecommunications Enterprise (ENTEL), in December 1981 a microwave connection between Bolivia and Argentina will be instituted, completing a program by the state telecommunications agencies of the two countries. The work on infrastructures will be completed in August, so that microwave equipment can be installed by October and the connection will begin testing in November. This link will increase to 24 channels the microwave links between the two countries, 20 more than now exist, and also making possible direct dialing in Yacuiba on the Bolivian-Argentine frontier. Direct dialing between Bolivia and Argentina might also be made possible by this new system, but technical and commercial studies are still being made on that. [Buenos Aires TELAM in Spanish 2150 GMT 14 Jul 81]

CSO: 5500/2280

BRIEFS

FREQUENCY BAND ALLOCATION--Buenos Aires, 22 Jun (TELAM)--A basic scheme for the allocation of frequency bands for fixed and mobile land radio communication services not connected with the public telephone network has been approved by a resolution of the under secretary of communications. This measure constitutes part of an overall plan to reorder the various frequency bands with the object of controlling the expansion of each service, satisfying current demand and providing, insofar as possible, for their evolution in the immediate future. The first step in this plan was designed to offer better facilities to those enterprises engaged in public telephone services which use radio communications systems, such as: radio links of medium and low capacity, mobile land radio telephones, rural telephones, public telephone booths and rural subscribers. The second step will be to reorder privately used communications services in commercial enterprises and official organs. [Text] [PY010354 Buenos Aires TELAM in Spanish 2115 GMT 22 Jun 81]

BROADCASTING DIRECTOR--Buenos Aires, 25 Jun (TELAM)--Col (ret) Ricardo Manuel Subiela today became the new national broadcasting director. [Buenos Aires TELAM in Spanish 1435 GMT 25 Jun 81]

CSO: 5500/2280

BROADCASTING POLICY DISPUTE RILES TELECOMMUNICATIONS CHIEF

Hamilton THE ROYAL GAZETTE in English 8 Jul 81 pp 1, 3

[Excerpts] Telecommunications chief Mr John Young confirmed last night that he had resigned over Government's handling of broadcasting decisions. He revealed that he disagreed with a number of matters contained in the recent policy report by the Hon. John Swan, Minister of Home Affairs.

Mr Young, the second member of the Government body to quit in unhappy circumstances within a month, further stated that he was in favour of broadcasting licences being granted to Cablevision and Starvision.

This 's an opinion shared by at least one other member of the Telecommunications Authority.

Mr John Fuge backed Mr Young on this point and Mr Charles Kempe is believed to have resigned last month for similar reasons.

Mr Young confirmed a number of points, disclosed by Cablevision head Mr Gavin Wilson, which show discontent with Mr Swan's actions.

They are that the Minister:

--Was not advised to adopt the broadcasting policy by the Telecommunications authority.

--Was not supported by the authority in his policy.

--Did not seek the authority's views.

--Did not bring to the authority's attention a study commissioned by ZFB and ZBM which he adopted in part.

--"I am unhappy with the way things have been going," Mr Young admitted.

"The Telecommunications Authority was not consulted about the policy. We agree with some points in it, but not others."

Mr Young said he was not in favour of the market being thrown wide open, but felt that licences should be given to the two companies as well as ZFB and ZBM.

"This is a country of free enterprise," he continued.

"I do not mean open it up wide and give everyone licences. Controls should be exercised on such matters as programming. Licences should be granted to the four companies and no others. That would be the end of it and people should be warned of that."

Mr Young said the Minister had given the go-ahead for receiving satellite transmissions without proper restrictions and controls being imposed.

CSO: 5500/7542

BRIEFS

SATELLITE USE APPROVAL--ZEM did not break the law when they used their own satellite dish to broadcast live coverage of the attempt on President Reagan's life, the Minister of Home Affairs said yesterday. And with no amendments to the Telecommunications Act planned, that means that ZEM will be free to use the dish to pick up and broadcast satellite signals in the future. The Hon. John Swan said that after consultations with the Attorney General's chamber, he had been advised that the use of satellite dishes, or earth stations, did not breach existing legislation. Since ZEM already possessed a licence to transmit television signals, no legal obstacles stood in the way of their using their dish. "It should be pointed out, however, that when using material received by an earth station, the onus is clearly on the receiver to ensure that the appropriate copyright clearances have been arranged with the owners of the material," said Mr Swan. [Excerpt] [Hamilton THE ROYAL GAZETTE in English 4 Jul 81 p 1]

CSO: 5500/7542

BOLIVIA

BRIEFS

DPA OFFICE IN LA PAZ--The DPA offices in La Paz were officially inaugurated yesterday. The DPA director for Peru was present and explained DPA's operations to newsmen. In the Andean region DPA relies on satellite links from the FRC to all the capitals in the region. In La Paz it will have equipment for a line via satellite from Hamburg to La Paz, which will permit a message to be relayed in less than a minute. Ana Marie de Campero will be the DPA correspondent in Bolivia. [La Paz EL DIARIO in Spanish 18 Jun 81 p 3]

CHURCH RADIO--Tarija, 22 Jun (PRESENCIA)--Loyala Cultural Action [Accion Cultural Loyala--ACLO] has installed a modern broadcasting station in Tarija, called Radio Tarija. It is to serve the public, especially the peasants. [La Paz PRESENCIA in Spanish 23 Jul 81 p 2]

CSO: 5500/2280

BRAZIL

BRIEFS

NEW TV STATION--President Figueiredo today presided over the dedication of a modern television station in Campos. On dedicating the new TV station--Channel 13 Norte Fluminense--in Campos, Rio de Janeiro State, President Figueiredo said that he is aware of the role which television plays as agent of our development. [PY202347 Brasilia Domestic Service in Portuguese 2200 GMT 16 Jul 81 PY]

CSO: 5500/2277

INTER-ARAB AFFAIRS

KUWAIT TO AID YAR IN TELECOMMUNICATIONS PROJECT

GF291205 Kuwait ARAB TIMES in English 29 Jul 81 p 5

[Text] Kuwait, 28 July (KUNA)--The Arab Fund for Economic and Social Development (AFESD) will provide a 1.4 million Kuwaiti dinar loan to North Yemen, a press release said.

The loan will be utilized in partial financing of the North Yemen portion in a joint telecommunication network.

The project is the third joint Arab scheme providing for a telecommunications link between Somalia, Djibouti, North Yemen, South Yemen and Saudi Arabia, the release added.

The agreement was signed by the fund's chairman and director general Dr Mohammad Al Anadi with North Yemen under secretary for transport Mohammed al Arshi.

The project is to close existing gaps in telecommunications between South Arabia and East Africa.

The 8.3 million dinar project will also provide a modern telecommunication facilities between the countries involved and lead to the improvement of telephone and telex services as well as relaying of television programs, the release added.

Meanwhile, the Arab Fund for Economic and Social Development (AFESD) is conducting a study on inter-Arab investments, a senior executive said today.

The study, in cooperation with the Pan-Arab Investment Guarantees Corporation and Kuwait Fund for Arab Economic Development will be expanded to include all Arab states after it was experimented in three parts of the region, Dr Ismail al Zabiri said in a press interview.

In its earlier stage, the study was restricted on means of investment in Kuwait, Jordan and North Yemen.

Earlier in the year, representatives of the three agencies visited the countries involved for discussions with business institutions particularly in Kuwait, he said.

Results of the experiment were encouraging to the extent that the study will now be applied all over the Arab world.

The second and final phase of the study will be carried out in September but it would be difficult to forecast the final result, Dr al Zabri added.

The completed study on means of investment in 17 Arab countries will be presented to a meeting of the fund's governors scheduled to open next April.

In cooperation with the Arab League and the Arab Monetary Fund, AFESD is also engaged in preparation of the 1981 report on unified Arab economy, he said.

Meanwhile Abu Dhabi Fund for Arab Economic Development (ADFAED) will concentrate on financing development projects in Islamic states, according to new directives by Crown Prince and Deputy Commander-in-Chief Shaykh Khalifah ibn Zayid, an announcement in Abu Dhabi said today.

CSO: 5500/2278

BRIEFS

TV RELAY STATIONS OPERATIONAL--As a result of the efforts and steadfastness of the committed technical staff of the Voice and Vision of the Islamic Republic of Iran seven new television relay stations became operational during the month of Ramadan in various parts of the country. The locations are as follows: Apadarreh station in the Province of Zanzan, covering 8 villages; Lavasanat-e Bozorg station in the Central Province, covering 37 villages; Balaghan Va Ahar station in the Central Province, covering 5 villages; Chah Malek station in the suburbs of Na'in in Esfahan, covering 6 villages; Jandaq station in the suburbs of Na'in in Esfahan, covering 16 villages; Khor Va Biyabanak station in the suburbs of Na'in Esfahan, covering 9 villages; Nurabad station in the Province of Luristan, covering 384 villages. The second television network has begun functioning in Kuhpanah in Arak in the Central Province, covering the cities of Arak, Saveh, Tafresh, (Ashtiyan) and about 450 villages. [Text] [LD021344 Tehran Domestic Service in Persian 1030 GMT 2 Aug 81]

TELEVISION REPEATER STATION--The repair and maintenance unit of the Voice and Vision of the Islamic Republic of Iran, Shiraz, has reported that the Bavanat television repeater is operational and that Bavanat citizens can now watch television programs of the Voice and Vision of the Islamic Republic. The television repeater will be used for a 6-month trial period. [Text] [GF110636 Shiraz Domestic Service in Persian 1430 GMT 10 Aug 81 GF]

TELEVISION RELAY STATIONS--As a result of the efforts and steadfastness of the committed technical staff of the Voice and Vision of the Islamic Republic of Iran seven new television relay stations became operational during the month of Ramadan in various parts of the country. The locations are as follows: Apadarreh station in the province of Zanzan, covering 8 villages; Lavasanat-e Bozorg station in the Central Province, covering 37 villages; Balaghan Va Anar station in the Central Province, covering 5 villages; Chah Malek station in the suburbs of Na'in in Esfahan, covering 6 villages; Jandaq station in the suburbs of Na'in in Esfahan, covering 16 villages; Khor Va Biyabanak station in the suburbs of Na'in Esfahan covering 9 villages; Nurabad station in the province of Luristan, covering 384 villages. The second television network has begun functioning in Kuhpanah in Arak in the Central Province, covering the cities of Arak, Saveh, Tafresh, (Ashtiyan) and about 450 villages. [Text] [LD021344 Tehran Domestic Service in Persian 1030 GMT 2 Aug 81]

BRIEFS

SATELLITE GROUND STATION--A contract has been signed in Baghdad between Iraq and the Soviet Union to build a ground station for satellite communications in Baghdad at a cost of one million Iraqi dinars. It was decided that the new station would be opened before the convening of the nonaligned conference to be held in Baghdad next year. This station will provide telephone links with a group of socialist and third world countries who presently utilize the services of the Soviet satellite "Sputnik". Among other services provided by the station will be the exchange of radio and television programs between Arab and socialist countries. Signing for Iraq was the president of the public telephone, telegraph, and post organization and signing for the Soviet firm, Braumish Export Organization, were a number of company officials. [Text] [London AL-DUSTUR in Arabic No 527, 20 Jul 81 p 38]

CSO: 5500/4724

BRIEFS

IRAQI-JORDANIAN MICROWAVE--Baghdad, 24 Jul (PETRA)--An unidentified Italian firm has won a contract from the Iraqi Ministry of Communications to implement the western Dijlah-Baghdad-Amman microwave project at a cost of \$40 million. The project, to be completed in 31 months, should make available 1,260 microwave telephone channels between Amman and Baghdad, in addition to two functioning broadcast channels and one spare. The project entails the installation of microwave equipment and the construction of 17 stations in Iraq extending over 500 kilometers and eight more in Jordanian territory, over 300 kilometers. The project, when completed, will ensure better radio and television programme exchanges between Jordan and Iraq. [Text] [JN251013 Amman JORDAN TIMES in English 25 Jul 81 p 2]

CSO: 5500/4725

BRIEFS

'ANG'-'ANOP' COOPERATION AGREEMENT--A cooperation agreement was signed the day before yesterday between the ANG (GUINEA-BISSAU NEWS AGENCY) and the ANOP (PORTUGUESE NEWS AGENCY). The two agencies agreed to exchange information on their respective countries, to be used later at an international level. The two parties promised to proceed to periodic air mail exchanges of photos that reflect the realities of the two countries, with special importance given to Africa. The agreement also includes the exchange of news items, thus establishing a line of contact between Portugal and Guinea-Bissau, with the work to be carried out by ANOP. Moreover, ANOP agreed to receive ANG journalists for training in Portugal or its branches abroad. In turn, ANG will receive in Bissau ANOP journalists and technicians, who will hold conferences and direct training seminars or just make study visits. The present agreement, which is valid for the period 1981-1982, will be tacitly renewed every year unless one of the parties gives notice of its intention to withdraw at least 3 months in advance. ANG was by represented Antonio Oscar Barbose, while ANOP was represented by information director Jose Manual Barroso. [Bissau NO PINTCHA in Portuguese 20 Jun 81 p 2]

CSO: 4728/83

BRIEFS

JAPANESE SYSTEM IN IBADAN--Three Japanese companies have won a \$71m. order to construct a microwave communications system in Ibadan, Marubeni Corporation has announced in Tokyo. Marubeni and the two other companies, Nippon Electric and Sumitomo Electric Industries, will supply equipment and undertake all installation work for the system to be completed in two years. The contract was from the Nigerian Communications Ministry. [Text] [London WEST AFRICA in English No 3337, 13 Jul 81 p 1601]

NIGER STATE BOOSTER STATIONS--Two new booster stations for the Niger State Broadcasting Corporation will start transmitting by early August this year. The two stations still under construction at Bida and Kontagora are worth N1 million. This was disclosed by the general manager of the corporation, Alhaji Ibrahim Ahmed when he and members of the board of directors visited the State Governor in Minna. [Text] [Lagos DAILY TIMES in English 11 Jul 81 p 23]

CSO: 5500/5055

ZAIRE

BRIEFS

COORDINATION WITH ANGOLA--The Angolan and Zairian aeronautical experts, who met for 48 hours at Linshasa, expressed, at the end of their work last Tuesday their common will to further improve the security of air traffic between Zaire and Angola. Citizen Maweto Konko Ntoya, chairman and delegate general of the Airlines Administration (AA) and chief of the Zairian delegation to these proceedings, indicated to the press that the discussions were basically centered on the problem of coordination in the aeronautical telecommunications field, with a view to a better exchange of messages between the two countries' airports. The AA chairman and delegate general, after having praised the initiative shown by the experts of the national Angolan air transport establishment (ENNA) in consulting with their Zairian colleagues, asked them to act as interpreters for the latter with the experts from the countries of central and southern Africa where they will go as part of their consultation mission. On Tuesday morning, the Angolan delegation, led by Jose Tonet, director general of the ENANA [expansion unknown] visited Ndjili international airport and left again for Lusaka and Maputo. [Text] [Lubumbashi LE QUOTIDIEN DU SHABA in French 6 May 81 p 6] 9434

CSO: 5500/5042

COMMUNICATIONS SATELLITE LAUNCHED

LD311520 Moscow TASS in English 1505 GMT 31 Jul 81

[Text] Moscow 31 Jul (TASS)--Under the programme of further development of communications systems and television broadcasting with the use of artificial earth satellites, the Soviet Union today launched the communications satellite "Raduga" with on-board relay equipment meant for ensuring continuous telephone and telegraph radio communication around the clock in the centimetre wave band and simultaneous broadcasting of colour and black-and-white programmes of central television to the network of the stations "Orbita."

The Sputnik "Raduga" was put into a circular orbit close to the stationary one at a distance of 36,690 kilometres from the earth's surface. The period of revolution around the earth is 24 hours 37 minutes. Inclination of the orbit is 0.4 degrees.

Besides the perfected multi-channel relay equipment for communication and television broadcasting, the satellite has the three axle system of precise orientation at the earth, the power supply system with independent guidance and orientation of solar batteries at the sun, the system of correction on the orbit, the thermoregulation system, the radio telemetric system for relaying to the earth the data about the work of on-board systems, the radio system for exact measurement of parameters of the orbit and guidance of the Sputnik.

The Sputnik "Raduga" has the international registration index "Stationar-2."

CSO: 5500/2278

TELECOMMUNICATIONS POLICY AWAITING CLARIFICATION

Paris ELECTRONIQUE ACTUALITES in French 12 Jun 81 pp 1,6

[Article by D Levy: "Profession Awaiting Clarification on Industrial and Telematics Policy"]

[Text] In assuming his duties as minister of the PTT [Post-Telegraph-Telephone] Mr Mexandeau inherited from his predecessor a series of files, some of which required immediate decisions and others which required clarifications, specifying the new government's intentions with respect to important questions, in particular industrial and telematics policies. Among the former, Mr Mexandeau will have to confirm measures concerning industrial studies on teletex and 100,000 EGT [General Telecommunications Enterprise] telecopiers, measures taken by the Administration before 10 May but which have not yet been made public as a courtesy to the new minister.

Basic changes in telecommunications are hardly expected in the next few weeks. The PTT, which again becomes a ministry and no longer a state secretariat, has acquired political dimension these past few years, particularly due to very large investments authorized for the development of telephone equipment (25 million francs in project authorizations per year), to completed industrial operations (Francization of the TMT [Telephone Material Company] and STE [Ericsson Telephone Company]), the restructuring of the AOIP [Association of Precision Instrument Workers] and of Depaepe [Company]), as well as to initiatives taken in telematics.

The PTT and, more precisely, the General Directorate of Telecommunications have also implemented an industrial policy based on company competitiveness (broad-based studies, cost reduction, export priority, releasing of terminals).

Industrial Studies Under Way

Before considering industrial policy studies, Mr Mexandeau will approve decisions made by his staff before his arrival at [the Ministry of the PTT on] Segur Avenue. Among these ongoing operations the ones most anxiously awaited concern the awarding of teletex terminal development and 100,000 telecopiers for wide distribution to be marketed by EGT.

Terminal development focuses on perfecting low-cost teletex terminals adapted to the new teletex services beginning to appear in Europe (Germany, then Sweden in the fall). This recently standardized service at CCITT [International Telegraph and Telephone Consultative Committee] consists as we recall, of transmitting texts, keyed into terminal, at 2,400 bits per second via the telephone system; they are then stored in the receiving terminal memory. A natural extension of the receiving terminal text handling, the teletex is considered to be the telex successor. At the conclusion of the DAII's [Directorate of Industrial and International Affairs] study, two manufacturers, Sagem and Alcatel Electronique (through its affiliate, Sintra), were selected (but contracts have not yet been formally awarded).

The second DAII study, carried out by EGT, presents a little less technical character: supplying the first 100,000 telecopiers for wide distribution to be marketed by EGT. The three manufacturers charged with developing the TGD [Wide-distribution Telecopiers] (Thomson-CSF, Sagem and Matra) have participated in the study. The winning bid was said to be formally announced on 11 May.

Other pending studies: the electronic satellite center and ITT's "System 12." The center has been dragging along since 1977, date of the industrial study. At its conclusion, four manufacturers (Jeumont-Schneider, SAT [Telecommunications Company, Inc.], Telic and the Matrit Group, formed by Matra, TRT [Radio and Telephone Telecommunications] and TIT [Toulouse Industrial Technical (Company)]) have been engaged to develop a low capacity, time-division auto-switch (up to 8,000 lines, expandable to 15,000 lines) for the French public network and, especially for export. When Telic's market research had been finished at the end of 1979, the three builders remaining in competition waited to know what the administration intended to order. A study on the installation of these satellite centers on trailers has been launched, but has not as yet reached any conclusions.

The CGCT Study and Nationalizations

Examination of ITT's "System 12" study no longer seems bound to be dissociated from a new definition of Telecommunications industrial policy. After about 2 years, CGCT, anxious about the interruption of space center operations by the DGT [General Directorate of Telecommunications], predicted to occur around 1983, offered to guarantee its continued operation by furnishing the numerical "System 12" developed in the ITT group. It was a political question to a high degree: On the one hand, CIT-Alcatel's "E-10" and Thomson-CSF's "MT" time-division centers seemed to moderately satisfy internal needs; on the other hand, could the DGT adopt a competitor's system while the first two experienced a true export "take off"? But again, the CGCT situation is deteriorating dangerously. That is why the DGT prepared to order three "Systems 12."

Today, the particulars of the situation are different. The CGCT [General Telephone Construction Company], like CGE and Thomson-CSF, is on the list of corporations to be nationalized. If the company is in fact nationalized--which depends, we must remember, on a law to be voted by Parliament--the company would be excluded from seeking a synergistic effect with the ITT group for export purposes. One would rather choose the "E-10" or "MT" manufactured by the CGCT.

Are we then heading towards a very large-scale integration between these three main PTT supplies? It is still too early to say.

But it is probable that new relations will be instituted among the manufacturers. Does that mean that cutthroat competition will be abandoned in favor of the "champion policy" mentioned by Mr Mitterrand during the last Salon des Composants?

Telematics

Finally, the new PTT minister will have to make clear his position regarding telematics. Mr Mexandeau's arrival coincides with the beginning of "Teletel" experiments in Velizy and the electronic directors in Ille-et-Vilaine (in 1982). Meanwhile, there is no need to believe that these experiments will give the minister a very long respite: the time factor plays a vital role in telematics and the French lead in this field is not more than a few months over their American competitors.

If Telic finds itself in a privileged position after Ille-et-Vilaine's order for 300,000 terminals, the other interested manufacturers (Matra, Thomson-CSF and TRT/RTC) are waiting impatiently for a government decision regarding widespread use of electronic directories. It is only at the expense of large-scale mass production that our builders will meet the challenge and keep themselves out of reach of competitors, who have very low costs and who will accept the challenge of telematics.

9626

CSO: 5500/2235

A 60-MHZ UNDERWATER COAXIAL LINE SYSTEM TO SICILY DESCRIBED

Rome NOTE, RECENSIONI, NOTIZIE in Italian Jan-Mar 81 pp 31-43

[Article by Engineer Andrea Bonati, of TELETTRA, Dr. Giuseppe Triolo, of the Telephones Services Agency, and Engineer Antonio Fadda, of ISPT: "Special 60-MHz Link Across the Strait of Messina"]

[Text] Summary

The project that has become necessary to make possible a 10,800 telephone channel link across the Strait of Messina on a pair of underwater coaxial cables is described in the present study.

In addition to a description of the plant, the special repeaters that have been produced and the characteristics measurements obtained are described in particular.

The results of the calculations and simulation experiments of the link are also reported. They show that, in spite of the exceptional nature of the stretch, the behavior obtained is similar to the behavior of normal 10,800-channel links.

1. Introduction

Links between the continent and Sicily are made at present by means of the following systems: two 960-channel cable links between Reggio Calabria and Messina, one radio link between Tanzaro and Catania and one 3,600-channel underwater cable link between Rome and Palermo.

For the purpose of making those links more effective, a highway main line with eight coaxial pairs is well on the way to completion between Nola and Reggio Calabria Messina and Catania and Messina and Palermo. Three 12-MHz systems are scheduled initially on that main line, interconnected by means of a radio link with a 5-beam 1,800-channel capacity. Subsequently expansion is scheduled with a Nola-Reggio Calabria system and a Catania-Messina system, both 60 MHz. Therefore it is necessary to make a link across the strait with a 10,800-channel capacity, in order to maintain homogeneity of the communication facilities requested by some services and to avoid demodulation and remodulation at the terminals. Because there are no underwater systems with that capacity, since the ones produced up to now do not exceed a capacity of 4,140 channel, it is necessary to use a land system.

The purpose of the present article is to describe the planning criteria for that system, putting particular emphasis on the most interesting equipment and also on the measurements made on them.

2. Planning Criteria for the Link

The objective of the plan was to avoid intermediate amplification on the underwater stretch owing to obvious problems of mechanical compatibility, watertightness and so on of possible submerged repeaters. For that purpose, the shortest underwater layout among the ones usable (figure 1) was selected. In addition, a cable with the largest available diameter was adopted, precisely a cable with an outside conductor 1.47 inches (37.34 millimeters) in diameter, produced by the Standard Telephone and Cable Company, Limited, with a characteristic impedance of 54 ohms. On the other hand, it was not possible to use a 1.7-inch cable, because there is no version with metal sheathing.

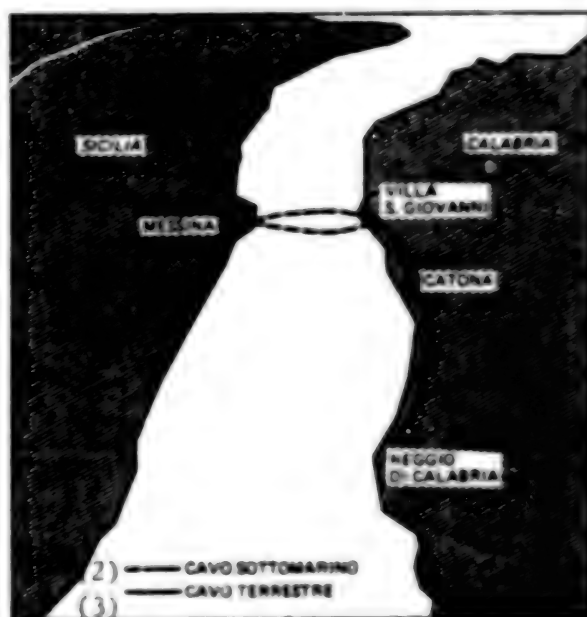


Figure 1. Layout of the 10,800-channel link between Messina and Reggio Calabria.
Key: 1. Sicily; 2. underwater cable; 3. land line

The length of the sea stretch turned out to be 6.5121 kilometers. The attenuation characteristic follows, with good approximation, at a temperature of 13°C, the following trinomial law:

$$\alpha(f) = (K_1 \sqrt{f} + K_2 f + K_3) l$$

in which

f = frequency in MHz

l = length in kilometers

$K_1 = 0.0839088 \text{ (db/km)} \cdot \sqrt{\text{MHz}}$

$K_2 = 0.026284 \text{ (db/km)} \cdot \text{MHz}$

$K_3 = 0.097968 \text{ (db/km)}$

The attenuation behaviors, measured and computed by the preceding formula, are shown in figure 2. Because the attenuation between the landing points, measured at a frequency of 61.160 MHz, is 54 decibels, in other words about 26 decibels above the nominal attenuation value of the amplification section of land systems, which equals 28.3 decibels, it was necessary to produce special repeaters to be installed at the ends of the underwater stretch. This solution accomplished with equipment from the TELETTRA Company makes it possible to obtain performance characteristics of the link included within the specified limits both with regard to noise and to overloading.

A cable with four coaxial pairs 2.6/9.5 millimeters, with two of its pairs arranged in order to be equipped with a 60-MHz system, was laid for making land connections between the landing points and the amplifying exchanges in Messina and Reggio Calabria.

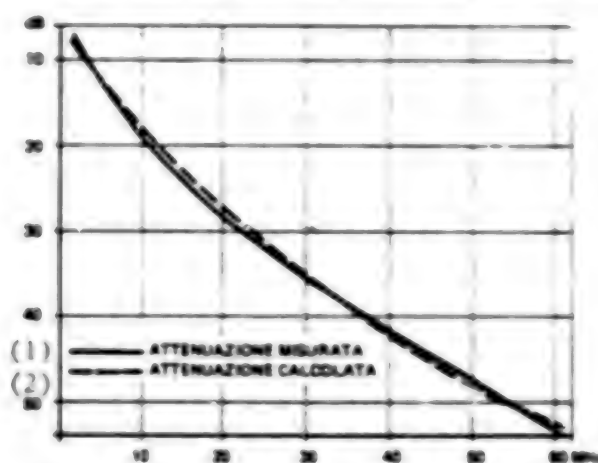


Figure 2. Attenuation of the submarine cable.

Key: 1. measured attenuation; 2. computed attenuation

Landing huts already in existence both on the Reggio side and on the Messina side are being used. The line equipment pertaining to the underwater stretch will also be installed in those places. The cable for the Reggio Calabria land section, about 13 kilometers long, leaves the landing hut presently at Torre Catona, follows commune and provincial roads in a trench for about 1.5 kilometers and finally it runs along the Salerno-Reggio Calabria superhighway for about 8 kilometers alongside the superhighway cable. Then it continues on for about 3.5 kilometers into the city reaching the ASST [State Telephone Services Agency] exchange in Reggio Calabria.

The cable for the Messina land stretch, about 2 kilometers long, follows mostly the SIP [Italian Telephone Company] city conduit.

The amplification points on the land section are provided in buried containers like the ones used for the highway network.

Figure 3 gives the connection diagram between Messina and Reggio Calabria indicating the lengths of the sections and their "exposures."

The values shown for each exposure type equal the maximums for each laying situation included in the type itself.

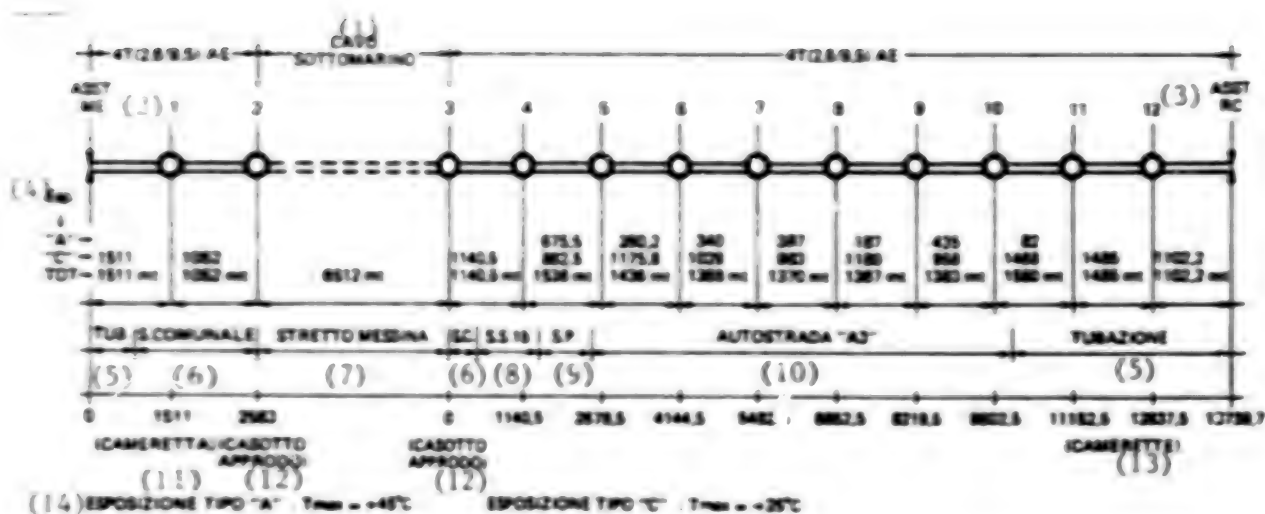


Figure 3. 10,800-channel coaxial cable link between ASST exchanges in Messina and Reggio Calabria.

Key: 1. underwater cable; 2. ASST Messina; 3. ASST Reggio Calabria; 4. exposure; 5. conduit; 6. commune road; 7. Strait of Messina; 8. secondary road; 9. provincial road; 10. Superhighway A3; 11. manhole; 12. landing hut; 13. manholes; 14. type A exposure: maximum temperature

Therefore, the computed situation turns out to be worse than the real situation, especially with regard to the calculation at minimum temperature, which was assumed to be symmetrical with the maximum with regard to the nominal temperature; but, while it is reasonable to suppose that particularly exposed sections may reach +45°C, it seems unlikely, on the other hand, that the same sections will go down to -15°C in the opposite season.

The equivalent ΔT was calculated for each repeater section

$$\Delta T_{eq} = \frac{\sum T_i \cdot L_i}{\sum L_i}$$

and the behaviors of the output levels of the line amplifiers at the frequency of the main guide (61.16 MHz), at maximum and minimum temperature, by introducing the situation described so far into a special computer program. Figure 4 charts the computed behaviors.

At nominal temperature, the curve for the levels at the frequency of the main guide is always included between ± 0.25 decibels at the output of each repeater.

1. Description of the Installation

Figure 5 gives a sketch of the installation that is expected to be provided. Remote power supply from the Regg. Calabria station is assumed.

It is seen from the sketch that it is possible to provide remote power supply from the Messina station as an alternative.

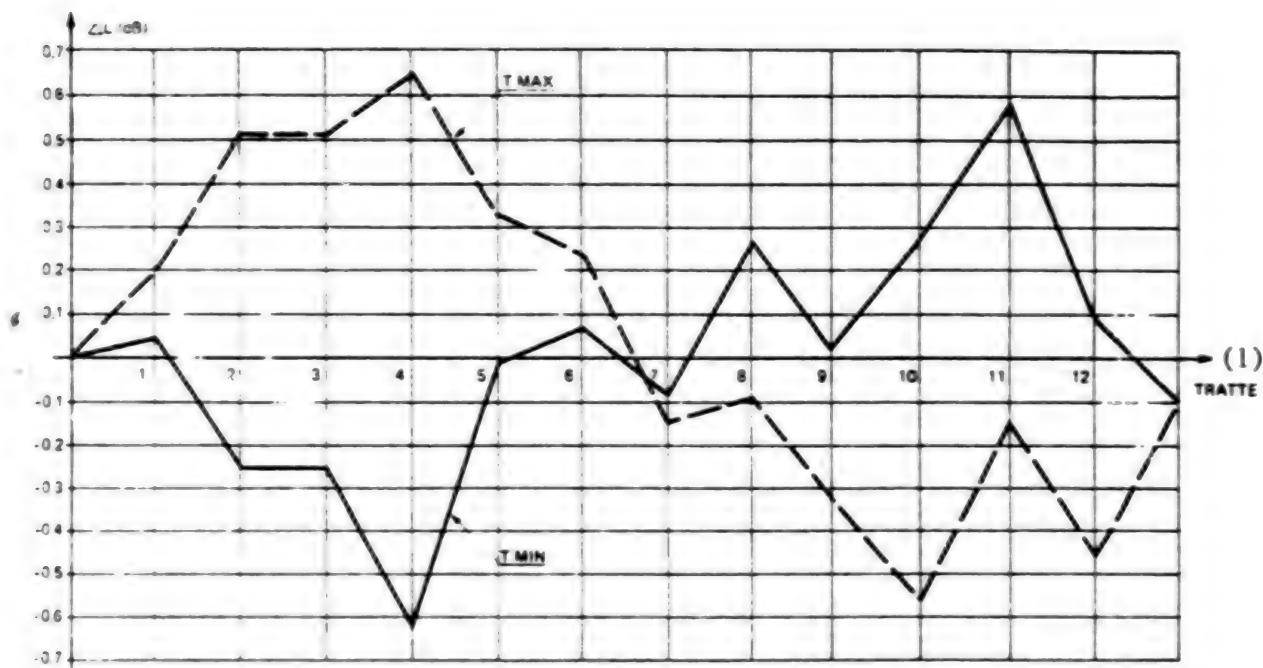


Figure 4. Sketch of the behavior of levels at maximum and minimum temperatures.
Key: 1. sections

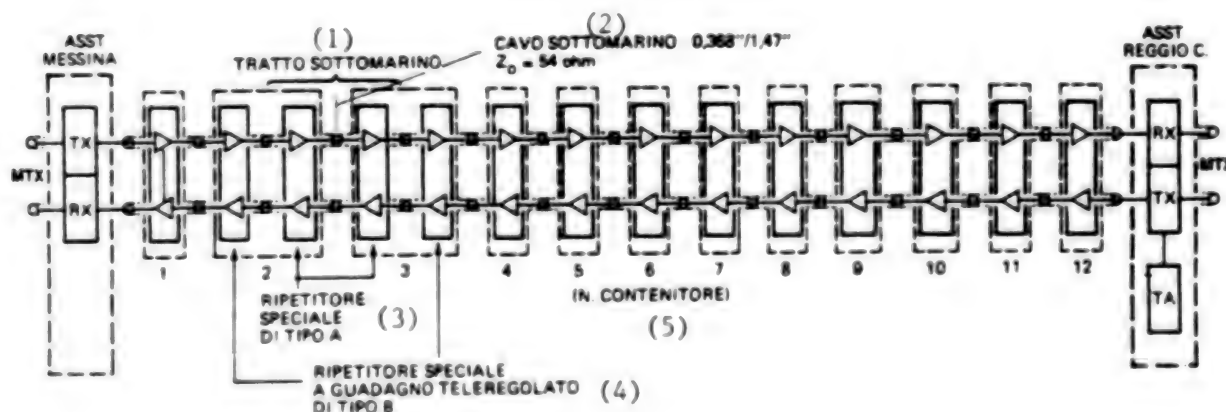


Figure 5. Simplified sketch of the 10,800-channel coaxial cable link between the ASST exchanges in Messina and Reggio Calabria.

Key: 1. underwater stretch; 2. underwater cable; 3. special type A repeater; 4. special type B repeater with remote-controller gain; 5. in container

NOTE: Repeaters 1 and 4-12 are of the normal type.

Repeaters 2 and 3 consist of a cascade of the two special type A and B repeaters.

Now we go on to a description of the underwater link section.

It is shown schematically in figure 6. It can be seen that two 10,800-channel repeaters in cascade, appropriately modified were used on both sides of the underwater section.

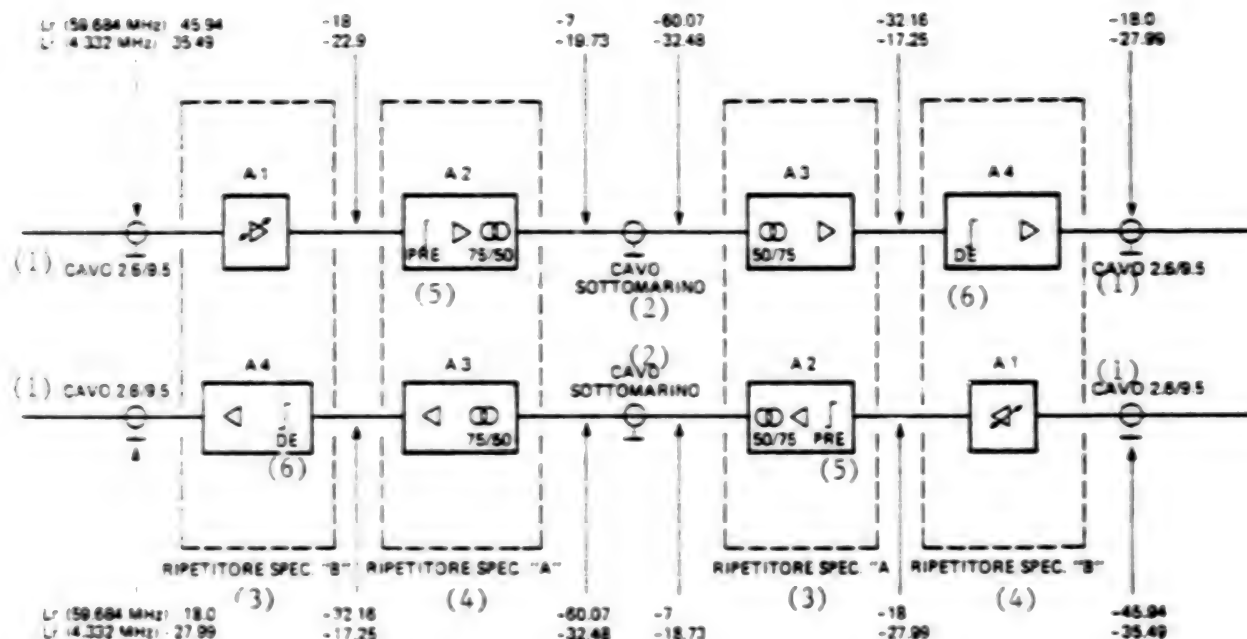


Figure 6. Diagram of the underwater link section.

Key: 1. cable; 2. underwater cable; 3. special B repeater; 4. special A repeater; 5. preemphasis; 6. deemphasis

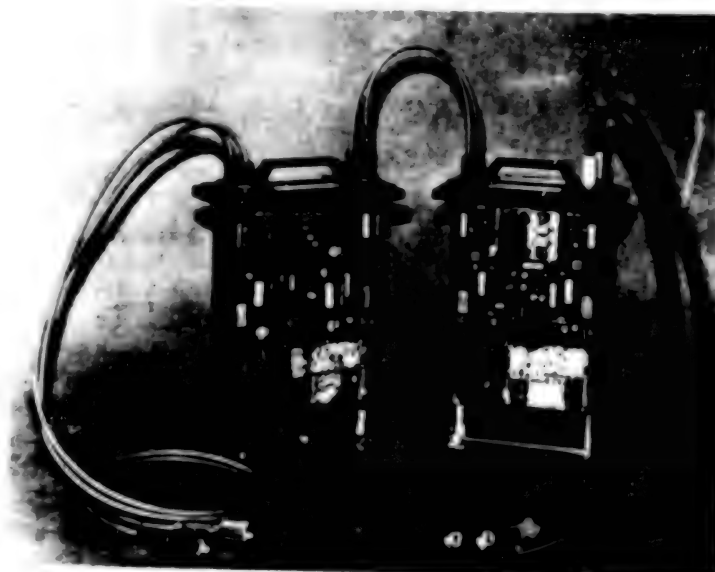


Figure 7. Special type A and B repeaters connected as in the installation.

With reference, for simplicity, to one single transmission direction, we give below the characteristics of the four amplification paths adjoining the underwater section in either of the two directions, which we shall call A1, A2, A3 and A4, respectively.

Messina-Reggio Calabria Direction

A1: normal 10,800-channel repeater path.

A2: special path, including

- i. additional preemphasis network.
- ii. high-overload, flat-gain amplifier.
- iii. 50-ohm impedance transformer-adaptor for the output toward the underwater cable.

A3: special path, including

- i. 50-ohm impedance transformer-adaptor in the input toward the underwater cable.
- ii. normal amplifier for 10,800 channels without preequalizer and set in fixed gain.

The sequence of the four amplification paths adjacent to the underwater section is exactly the same for the Reggio Calabria-Messina direction. Therefore, on the path opposite the type A1 path, there is an amplification path identical with the path shown with A4 and the same applies to A2 and A3.

Thus we see that, finally, the resultant structure of the repeaters involved is, on the whole of two types:

1. Special two-directional repeater (or type A) with path 1 with type A3 amplification and path 2 with type A2 amplification.
2. Special two-directional repeater with remote-controlled gain (or type B) with path 1 of type A1 amplification and path 2 with type A4 amplification.

This last-mentioned repeater differs from normal two-directional repeaters only in utilization, on path 2, of the additional deemphasis circuit (placed in the extension cable circuit position) and in the fixed setting of the amplifier placed on the same path. At any rate, the remote control arrangement is available if the temperature variations of the underwater stretch are greater than anticipated at present.

Therefore, the same configuration is installed on both sides of the underwater section. It consists of a cascade of two special repeaters: one type A adjacent to the underwater cable directly connected to a type B repeater adjacent to the land cable. An example of this configuration is shown in figure 7.

At this point, it is clear how, for these special repeaters, the establishment of connections and of the alternation of the various paths is unambiguous and definitely arranged and stems precisely from the special installation plan described above.

Moreover, because the characteristic impedance of the underwater cable is about 50 ohms, it has been determined advisable to use the output and input impedance for the repeaters on the transmission and receiving sides of the underwater stretch.

The necessary modification was made by replacing a transformer and redesigning a power filter, thus obtaining a greater overload margin with the same consumption.

The calculations and the remarks developed are found in appendix 1.

The level for the 59.684-MHz frequency at the input of the underwater cable was fixed at -7 decibels.

The level for the same frequency at the output of the type B repeater on the land side is the normal level for the system: -18 decibels.

The circuit making the additional preemphasis $p_2(f)$ also shows an attenuation equal to 3.62 decibels (at $f_{\max} = 59.684$ MHz assumed as null attenuation frequency for $p_2(f)$).

Thus, the gain required at the flat amplifier in block A2 proves to be

$$G_{\text{ampl.R2}} = +18.00 - 7.00 + 3.62 + 0.36 = 14.98 \text{ dBpp}$$

in which an additional loss, equal to 0.36 decibels, due to the characteristics of the components used (for example the loss due to the impedance transformer-adaptors, was added.

If the attenuation curve of the underwater cable is known and if it is recalled that the A3 amplifier has no preequalizer, it is possible immediately to derive the signal levels at the various frequencies for the different sections of the stretch under consideration shown in figure 6.

4. Calculation of Noises on the Underwater Cable Stretch

These special 10,800-channel apparatuses were designed by setting the value of the noise introduced by the repeaters adjacent to the underwater section at 30 pWOp. An additional preemphasis circuit $p_2(f)$ was created, for this purpose, in order to optimize, with regard to the special flat gain amplifier (present in A2) both the minimum level of peak sinusoidal overload and the contribution to the intermodulation noises.

The corresponding plate is inserted mechanically in the position of the extension cable in type A2 paths. This causes a subsequent shaping of the multiplex signal spectrum (recovered later by the added deemphasis circuit present in A4), in addition to the shaping produced by the normal preemphasis of the 60-MHz system inserted in the transmission loop.

The added preemphasis was accomplished by means of two 2nd grade cells.

Figure 8 shows the behaviors of the added preemphasis $p_2(f)$, of the normal preemphasis $p_1(f)$ and of the cascade of the two $p_1(f) \times p_1(f)$.

An overload reduction factor $k_p = -7.93$ decibels is obtained with the cascade of the two preemphases $p_1(f)$ and $p_2(f)$, compared with a factor of $k_p = -4.78$ decibels provided by the normal preemphasis $p_1(f)$ alone.

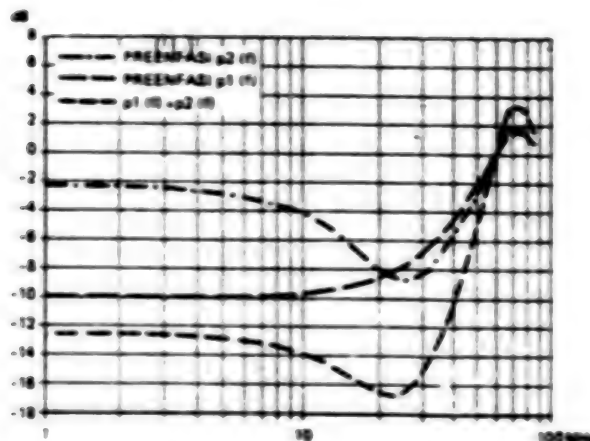


Figure 8. Attenuation of the normal pre-emphasis $p_1(f)$, of the added preemphasis $p_2(f)$, of the total preemphasis $p_1(f) \times p_2(f)$.
Key: 1. preemphasis

If we set the level at the output of the A2 amplifier at the maximum frequency at

$$L_{ru_{A2}} (59.684 \text{ MHz}) = -7 \text{ dBr}$$

then level L_p of the minimum peak sinusoidal overload required of amplifier A2 will be given by

$$L_p = P_m + 10 \cdot \log_{10} N + F_p + L_{ru} + k_p$$

in which

P_m = average power of a telephone channel with reference to the relative level point 0 :-15 dBmO.

N = number of channels transmitted: 10,800.

F_p = peak factor of the multiplex signal with probability of being exceeded equal to 10^{-5} : 13 decibels.

L_{ru} = nominal relative output level at the maximum signal frequency: $L_{ru_{A2}} + -7\text{dBr}$

k_p = overload reduction factor due to preemphasis: $k_p = 7.93 \text{ dB}$.

Then:

$$L_p = -15 + 40.3 + 13 - 7 - 7.93 = 23.37 \text{ dBm}$$

In order to keep a margin of 5 dB on the peak power, special amplifier A2 must have a peak sinusoidal overload equal to +28.37 dBm (in other words, with an rms [expansion unknown, probably relative average sinusoidal] overload of +25.37 dBm).

We now go on to the actual calculation of noises on the underwater stretch. Figure 9 shows the behaviors of the minimum values for the harmonic distortion coefficients $d_{10}(f)$ and $d_{30}(f)$ of the A2 path amplifier required for staying within the preset limit of 30 pWOp of total noise.

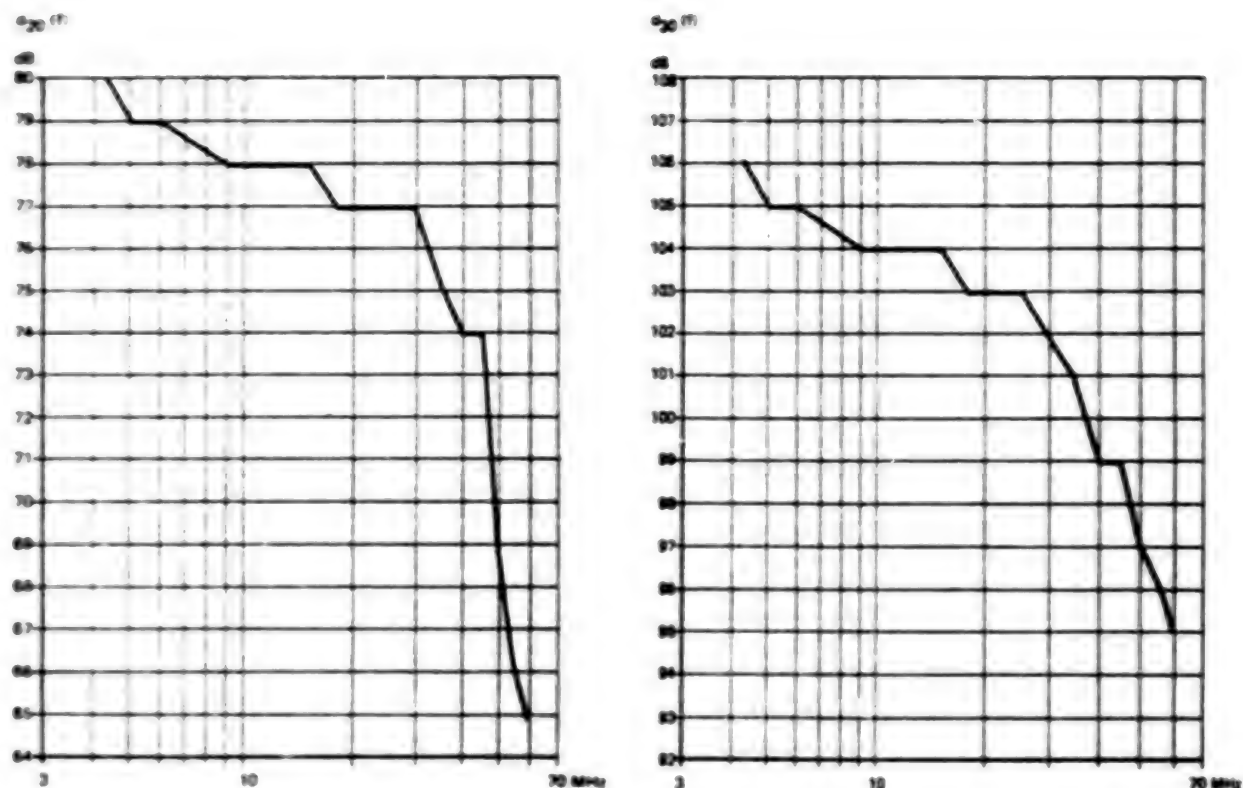


Figure 9. Minimum harmonic distortion coefficients $d_{20}(f)$ and $d_{30}(f)$.

Based on the proposed total preemphasis $p_1(f) \times p_2(f)$, values of the intermodulation noise distribution coefficients $Y_2(f)$ and $Y_3(f)$, shown in figure 10, were then calculated.

The values for thermal noise, second and third harmonic intermodulation and total noise generated by cascade amplification paths A2 and A3 on the underwater cable were obtained by introducing the above data in an appropriate computer program.

These data are shown in figure 11.

By adding to the noise contribution by the two repeaters adjacent to the underwater section the noise of the 12 remaining repeaters and the terminal noise, the total noise on the Messina-Reggio Calabria link is obtained. The respective contributions are presented analytically in table 1.

It can be noted that with regard to the terminal noise contribution the values attributed to the manual seasonal error equalizer were separated from the values of the terminal alone.

Computation of total noise variations under extreme temperature conditions was made at the maximum signal frequency at which there is worst noise.

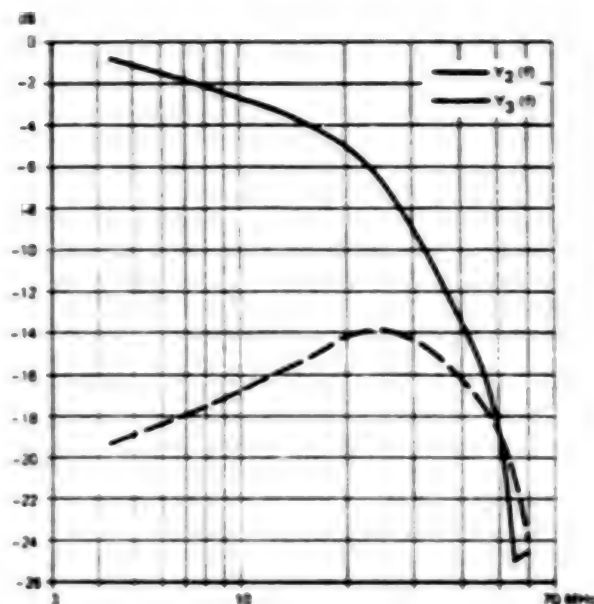


Figure 10. Behavior of intermodulation noise distribution coefficients $Y_2(f)$ and $Y_3(f)$.

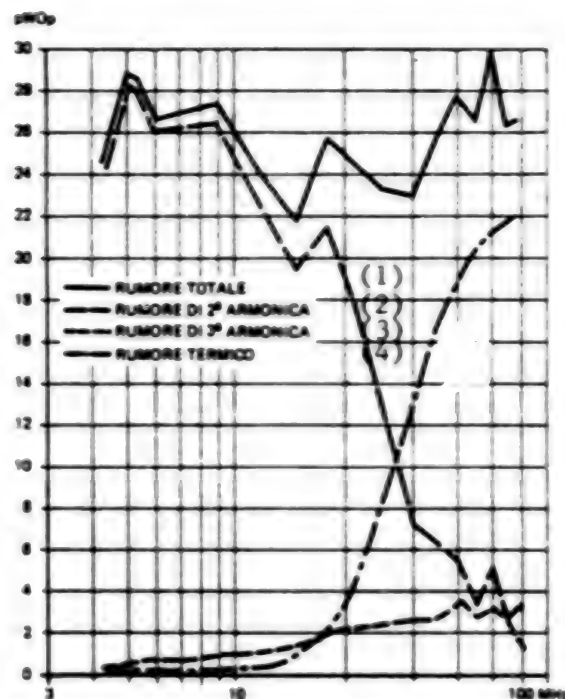


Figure 11. Underwater stretch noises
Key: 1. total noise; 2. second harmonic noise; 3. third harmonic noise; 4 thermal noise

Table 1: Total Noise Predicted on the Messina-Reggio Calabria Link

	5340 MHz	35748 MHz	55548 MHz
Terminal noise without manual seasonal error equalizer (pWOp)	7	7	10
Manual seasonal error equalizer noise (pWOp)	5	5	5
Repeater noise (pWOp/km)	0.4	0.8	1
Repeater noise adjacent to the underwater stretch (A2 + A3) (pWOp)	28.6	25.9	26.4
Total noise at nominal temperature (pWOp)	48.1	53	60

Thus, the following two noise values are obtained:

$$N_{\text{tot}} = 62.26 \text{ pWOp at maximum temperature}$$

$$N_{\text{tot}} = 58.2 \text{ pWOp at minimum temperature}$$

5. Special Type A and B Two-directional Secondary Repeaters

The block diagram for the special type A two-directional secondary repeater is given in figure 12.

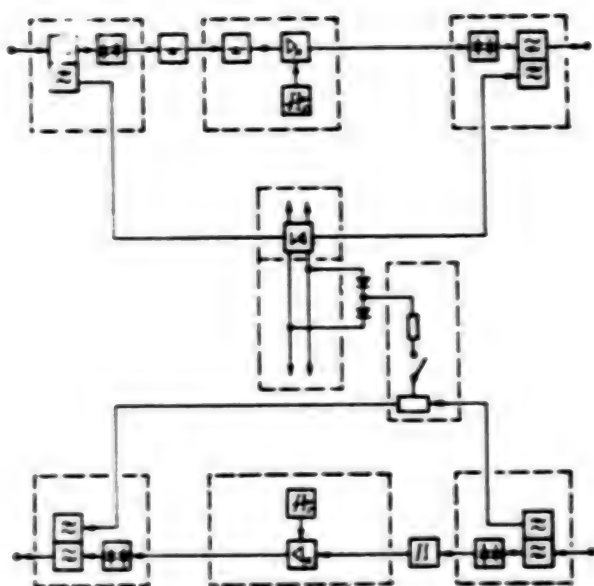


Figure 12. Block diagram of the special type A secondary repeater

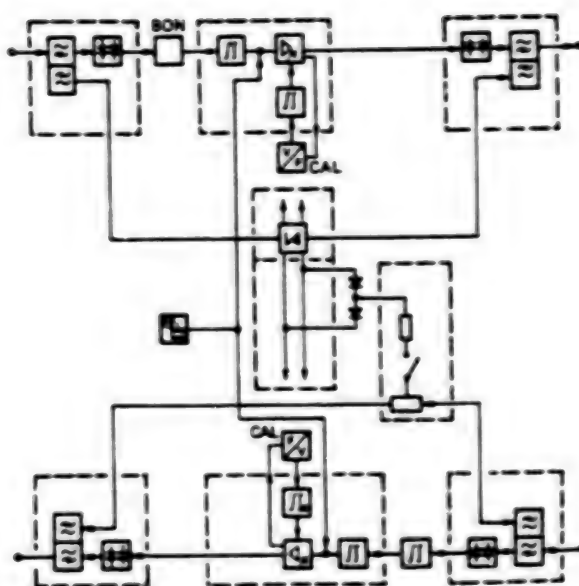


Figure 13. Block diagram of the two-directional, remote-controlled gain type B secondary repeater.

The normal repeater lacks the following circuits:

1. Radio frequency remote control oscillator.
2. Remote control circuit for each amplification direction.

In fact:

[a] Remote control in high frequency is handled by the oscillator present in the special type B two-directional secondary repeater coupled to the one under consideration.

[b] In order to handle the larger current absorption required by the amplifier at high overload (up to 185 milliamperes) present on path 2, the 10 milliamperes absorbed normally by the remote control oscillator and the 15 + 15 milliamperes absorbed normally by the two remote control circuits are used.

[c] Automatic gain control is not required for the amplification paths immediately adjacent to the underwater stretch, because the underwater cable undergoes negligible temperature variations and also its temperature coefficient value is $0.9 \times 10^{-3}/^{\circ}\text{C}$ (while the normal 2.6/9.5-millimeter coaxial cable has a temperature coefficient of $2.1 \times 10^{-3}/^{\circ}\text{C}$).

On the other hand, with regard to the following circuits:

1. Path 2 line complement
2. Path 1 preequalization,
3. Path 2 amplifier-preequalizer,

a replacement was made in the arrangement, as appears in figure 12, with the following circuits designed "ad hoc":

1. Additional preemphasis $P_2(f)$.
2. Line matched to 75 ohms.
3. High overload flat amplifier.

It was necessary to increase the typical voltage drop of the 60-MHz repeater (21.5 volts $\pm$ 1 volt) to 26 volts $\pm$ 1 volt, in order to provide the flat amplifier placed on path 2 with the required overload level.

The block diagram for the special two-directional remote-controlled gain type B secondary repeater is shown in figure 13. As has already been said, this repeater differs from the normal two-directional remote-controlled repeater, because on path 2 the amplifier works with a fixed gain arrangement and because the extension cable circuit was replaced with the additional deemphasis circuit.

Deemphasis consists of a cascade of four T-shunt type cells.

Simulation of the Entire Link Adjacent to the Underwater Stretch

A laboratory simulation of the entire link adjacent to the underwater stretch was made for a further check of the design calculations and of the measurements obtained on the individual special units.

Therefore, a circuit was designed and produced (artificial line) simulating in a serviceable sector a 50-ohm underwater link conduit with a length equal to 6.5121 kilometers.

With this kind of artificial line, it was possible to make the measuring link shown in figure 14.

The total noise measured on that kind of link in comparison with the noise computed at the nominal value of the output level is given in table 2 and is charted in figure 15. It can be concluded that the results are broadly within the predetermined total noise limits in the stretch and in the worst window (30 pWOp) and marginal toward overload (5 decibels).

It is, in fact, seen that, as is generally ascertained in practice, at the low part of the band the resultant noise is much lower than calculated, owing both to the lower value of the distortion coefficients obtained for the various amplifiers in comparison with the desired coefficients, and to the group delay variation in that band causing a better composition of the cascade noises.

Confirmation Measurements of the Special Repeaters

Confirmations were obtained by an ISPT [expansion unknown] representative, in the laboratories of the supplying company, from 2 to 4 July 1980.

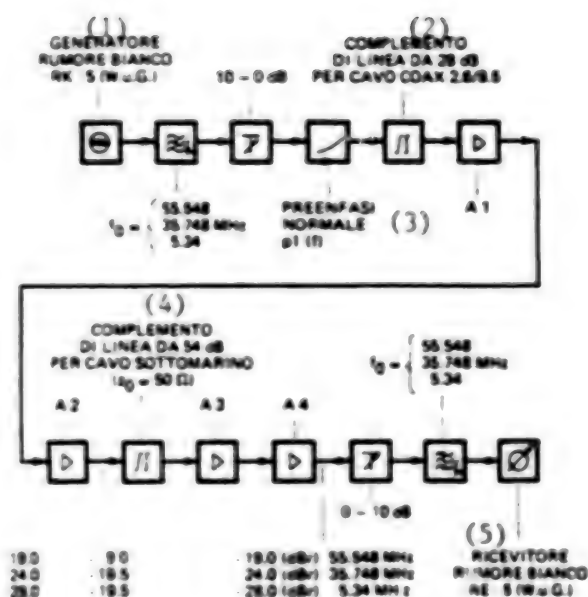


Figure 14. Block diagram for a simulation of the entire link adjacent to the underwater section for purposes of measuring total noise.

Key: 1. white noise generator; 2. 28-decibel artificial line for a 2.6/9.5 coaxial cable; 3. normal preemphasis; 4. 54-decibel artificial line for underwater cable; 5. white noise receiver

Special attention was paid, in the choice and development of the measurements, to those measurements apt to characterize especially the various performances with regard to the normal characteristics of a line repeater for the 10,800 telephone channel system.

Thus, three samples of a special type A two-directional repeater and three of a type B repeater were examined.

The following measurements were obtained for the type A repeater:

- Remote power supply voltage drop at the repeater heads and on its every individual path.
- Reflection attenuation at the gates.

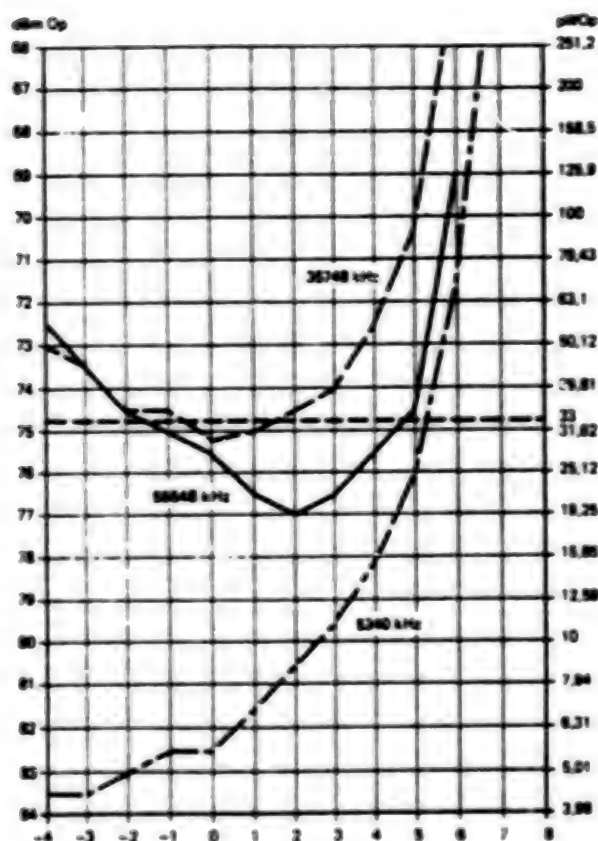


Figure 15. Total noise measured on the underwater section plus a land section.

Table 2: Total Noise Measured on the Underwater Section Plus a Land Section

L_{ru} (dB)	- 28		- 24		- 19	
Freq. MHz	5.340		35.748		55.548	
ΔL_{ru} dB	dBmOp	pWOp	dBmOp	pWOp	dBmOp	pWOp
- ∞	89.5	1.1	77	20	76	25
- 4	83.5	4.5	73	50	72.5	56
- 3	83.5	4.5	73.5	44.7	73.5	44.7
- 2	83	5	74.5	35.5	74.5	35.5
- 1	82.5	5.6	74.5	35.5	75	31.6
0	82.5	5.6	75.2	30.2	75.5	28
(1) Valore Calcolato	75.3	29.8	75.5	28.4	75.3	29.5
+ 1	81.5	7	75	31.6	76.5	22.4
+ 2	80.5	8.9	74.5	35.5	77	20
+ 3	79.5	11	74	40	76.5	20
+ 4	78	16	72.5	56	75.5	28
+ 5	76	25	70.3	93	74.5	35.5
+ 6	71.5	71	64.5	355	69	126
+ 7	62		55.5			

Key: 1. computed value

c. Paths A2 and A3 frequency level characteristic.

d. Self-induction.

e. Noise figure.

f. Total noise.

g. Intermodulation coefficients.

The following measurements were obtained for the type B repeater:

h. Reflection characteristic.

i. Path A4 frequency level characteristic.

l. Self-induction.

The results of the measurements obtained by using traditional automated plans with a computer, varied only to adjust the levels to the levels required by the special repeaters, are given below in outline form.

a. Remote power supply voltage drop:

The remote power supply current is 330 milliamperes. The results are given in table 3, below.

Table 3: Supply Voltages for the Special Type A Repeater

Register number	001	002	003
Voltage drop on the two-dimensional repeater (volts)	26.6	26.9	26.8
Voltage drop on the two-dimensional repeater (volts)	25.36	25.63	25.51
Voltage drop on path A2 (volts)	22.28	22.4	22.34

b and h. Reflection attenuation:

The reflection attenuations at the various gates in the band from 3 to 100 MHz were measured and printed. Only the worst values picked up on the useful signal band (4.332-59.684 MHz) are given in table 4.

Table 4: Minimum Reflection Attenuation Values at the Gates of the Special Repeaters (in decibels) (Worst values in the 4.332-59.684 MHz band)

	Register No.	Path 1		Path 2	
		Input	Output	Input	Output
Special	001	19.73	22.09	22.33	17.05
Type A	002	18.93	24.43	24.14	16.17
Repeater	003	21.14	24.96	27.76	17.42
Special	001	22.88	21.79	27.99	22.71
Type B	002	20.14	23.25	27.78	23.81
Repeater	003	20.96	28.19	28.62	21.87

c. Frequency level characteristic:

The measurement given is the result of a computer processing of observations taken in rapid sequence automatically, in order to reduce to the minimum the errors inherent in the measurement bench and to have precise results within ± 0.02 decibels. The curves for the behaviors desired for the gain of the two paths are given in figure 16. By subtracting the corresponding objective values from the measurements, the deviation values are obtained. The maximum values observed on the useful band are given in table 5.

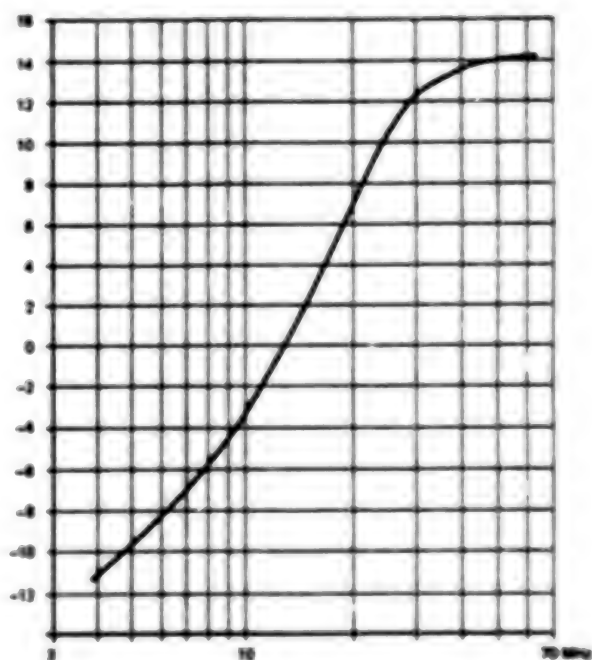
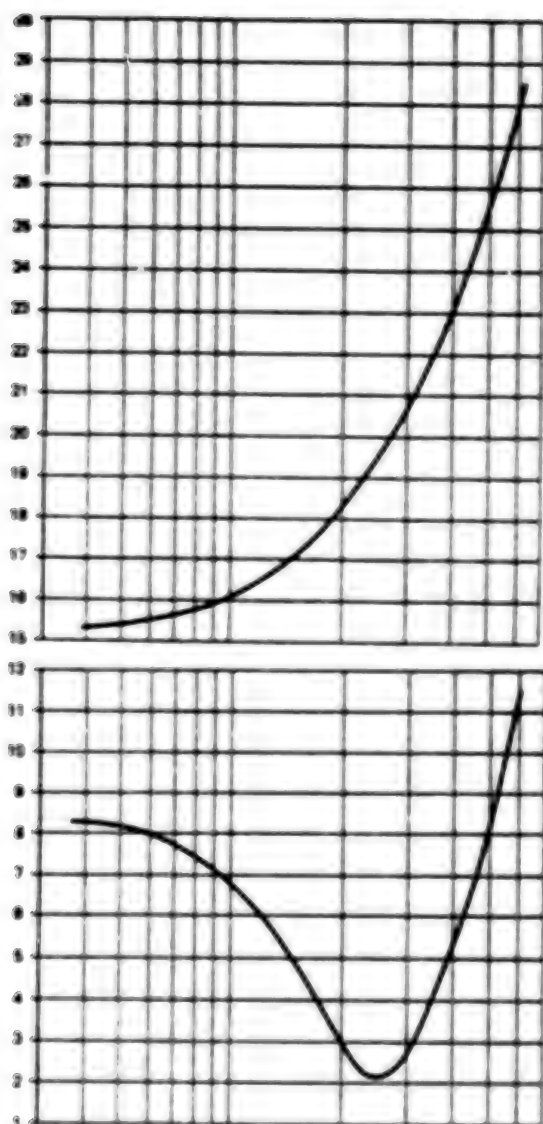


Figure 16. Path 1 and 2 gain of the Special Type A repeater and of path 2 of the Special Type B repeater (in sequence from bottom to top).

Table 5. Deviations of the Frequency Level Characteristics
Measured by the Special Type A Repeaters

<u>Register Number/Path</u>	<u>001/1</u>	<u>001/2</u>	<u>002/1</u>	<u>002/2</u>	<u>003/1</u>	<u>003/2</u>
Maximum positive deviation (decibels)	+0.11	+0.13	+0.13	+0.14	+0.13	+0.19
Maximum negative deviation (decibels)	-0.13	-0.16	-0.16	-0.16	-0.11	-0.10

d. Self-induction

The minimum values measured for the self-induction deviation on the useful band are given in table 6

Table 6: Minimum Self-induction Deviation Values Measures on the Useful Band
for the Special Type A Repeater

<u>Register Number</u>	<u>001</u>	<u>002</u>	<u>003</u>
Self-induction direction (Path→X Path→Y)	1→2 2→1	1→2 2→1	1→2 2→1
Minimum self-induction deviation (decibels)	125 106	124 105	124 109

e. Noise figure:

Noise figure measurements require special precautions and would, moreover, seem to be redundant when, as in this case, there are also measurements of total noise. It was, however, decided to require them, in order to characterize the repeater as completely as possible.

The following are the results:

Noise figure of the path of type A2: F1 = 10 dB (at 55.548 MHz)

Noise figure of the path of type A3: F2 = 4.2 dB (at 55.548 MHz).

f. Total noise:

Figure 17 shows the behaviors measured for the total noise of path A2 of the Type A repeater.

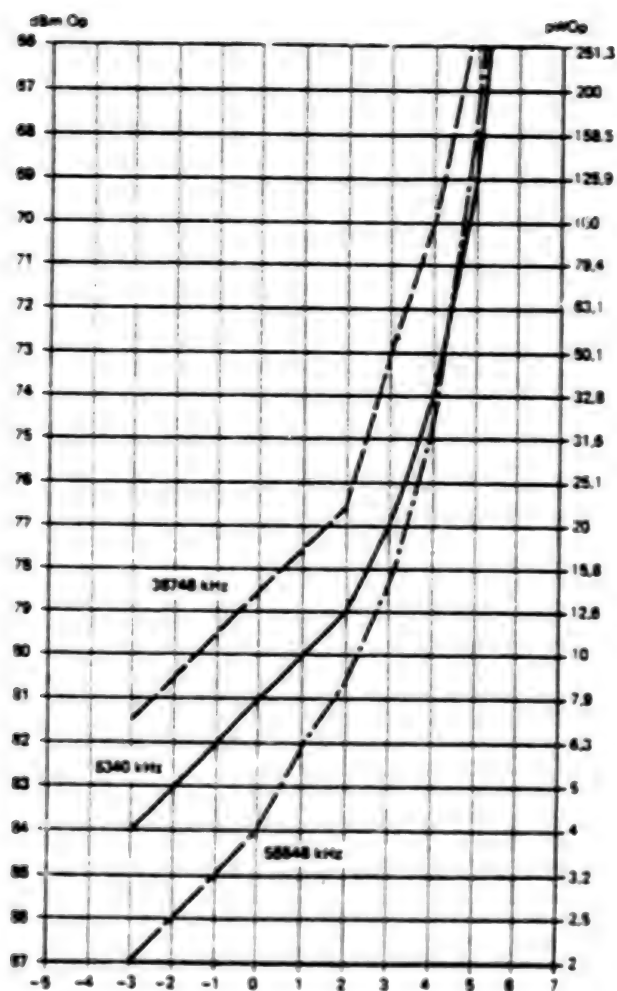


Figure 17. Total noise on path 2 of the special type A repeater.

g. Intermodulation coefficients:

The values measured for the intermodulation coefficients of path 2 of the special repeater with 0 dBm at the output for each measurement tone are given in table 7.

Table 7: Intermodulation Coefficients d_{20} and d_{30} of Path A2 of the Special Type A Repeater

Register Number	001	002
d_{20} ($f = 5.34$ MHz)	81	82
d_{30} ($f = 5.34$ MHz)	105	106
d_{20} ($f = 55.548$ MHz)	70	69
d_{30} ($f = 55.548$ MHz)	103	106

i. Frequency level characteristic (Path A4):

The desired behavior curve for path A4 is given in figure 14 [sic, possibly should read 4]. By subtracting the corresponding objective values from the measurements, the deviation values are obtained. The maximum values observed on the useful band are given in table 8.

Table 8: Frequency Level Characteristic Deviations Measured by the Special Type B Repeaters

<u>Register Number</u>	<u>001/A4</u>	<u>002/A4</u>	<u>003/A4</u>
Maximum positive deviation (decibels)	+0.17	+0.17	+0.17
Maximum negative deviation (decibels)	-0.14	-0.14	-0.12

Because the opposite amplification path is a normal 10,800-channel path, therefore the normal test values contained between ± 0.07 decibels are applicable.

1. Self-induction

The minimum values measured for the self-induction deviation on the useful band are given in table 9.

Table 9: Minimum Self-induction Values Measured on the Useful Band for the Special Type B Repeater

<u>Register Number</u>	<u>001</u>		<u>002</u>		<u>003</u>	
Self-induction direction (path X $\rightarrow$ path Y)	1 $\rightarrow$ 2	2 $\rightarrow$ 1	1 $\rightarrow$ 2	2 $\rightarrow$ 1	1 $\rightarrow$ 2	2 $\rightarrow$ 1
Minimum self-induction deviation (decibels)	116	109	115	108	118	102

Appendix i

The effects of a failure to match 75-ohm repeaters with 50-ohm cable are:

- Appearance of the roll effect.
- Loss on overload.
- Alteration of the gain-frequency response curve.

Point c is avoidable, at any rate, by designing equalization of the repeater at 50 ohms. Therefore, we are examining only the first two points.

a. Roll effect

According to bibliographical reference 3, calculation of the amplitude of the roll effect at 4.3 MHz provides the following result:

$$\text{Att.}_{\text{line}}(f=4.3 \text{ MHz}) = 3.8 + 3.51 = 7.34 \text{ dB} \approx 13 \text{ dB}$$

Assuming that the repeaters are perfectly matched at 75 ohms, they give rise to a reflection coefficient with regard to the 50-ohm cable equal to

$$A_{\text{refl}} = 20 \lg_{10} \frac{75 + 50}{75 - 50} = 14 \text{ dB}$$

Then the result is, by placing

$$N_{\text{dB}} = A_{\text{refl in}} + A_{\text{refl out}} + 2 \cdot \text{Att}_{\text{line}} = 54 \text{ dB}$$

$A_{\text{refl in}} = A_{\text{refl out}} = A_{\text{refl}}$

Therefore, the peak value of the roll is

$$r_{\text{dB}} = 8.6859 e^{N_{\text{dB}}/8.6859} \text{ dB} = 0.02 \text{ dB}$$

If account is taken of the fact that there is only one repeater section in which a roll effect of that size appears, it is to be regarded as negligible.

b. Loss on overload due to mismatch at output

The output of a repeater with an fem generator E and internal impedance $Z_G = 75$ ohms is shown schematically in figure 18.

The following relations can be written:

$$V_L = \frac{E}{2} \cdot e^{-\gamma L} \quad \text{in case } Z_0 = Z_G$$

$$P_0 = \frac{V_L^2}{Z_G} = \frac{\frac{E^2}{4} \cdot e^{-2\gamma L}}{Z_G} \quad (1)$$

If $Z_0 = 50$ ohms $\neq Z_G$, the coefficient of reflection on the load, ρ_L , is

$$\rho_L = \frac{Z_G - Z_0}{Z_G + Z_0} = \frac{75 - 50}{75 + 50} = 0.2$$

By indicating the coefficient of reflection between line and Z_G with ρ_G , it can be deduced from its expression

$$\rho_G = \rho_L \cdot e^{-2\gamma L}$$

that it is practically negligible.



Figure 18.

On the other hand, the reflection coefficient between line and load turns out to be

$$\rho' = \frac{Z_0 - Z_G}{Z_0 - Z_H} = -0.2$$

Now we intend to calculate P_L/P_0 . From the following relations:

$$V_i = V_i^+ (1 + \rho_G)$$

$$V_L = V_L^+ (1 + \rho_L)$$

$$V_L^+ = V_i^+ e^{-\gamma L}$$

the following expressions are derived:

$$\begin{aligned} V_L &= V_i e^{-\gamma L} (1 + \rho_L) \\ V_L &= V_i e^{-\gamma L} \frac{1 + \rho_L}{1 + \rho_G} = e^{-\gamma L} \cdot \frac{1 + \rho_L}{1 + \rho_G} \cdot \frac{E}{2} \cdot (1 + \rho') \end{aligned} \quad (2)$$

Therefore, the following results:

$$P_L = \frac{V_L^2}{Z_G} \quad (3)$$

The following is obtained by substituting (2) in (3):

$$P_L = \frac{1}{Z_G} \cdot \left[e^{-\gamma L} \frac{(1 + \rho_L)(1 + \rho')}{1 + \rho_G} \right]^2 \quad (4)$$

Finally, the following is obtained from the ratio between (4) and (1):

$$\frac{P_L}{P_0} = \left[\frac{(1 + \rho_L)(1 + \rho')}{1 + \rho_G} \right]^2 \quad (5)$$

In other words:

$$(P_L)_{dB} - (P_0)_{dB} = 20 \lg_{10} \frac{(1 + \rho_L)(1 + \rho')}{1 + \rho_G} \approx -0.36 \text{ dB}$$

Loss on overload due to mismatching, therefore, equals 0.36 decibels. There is also an additional loss from the moment when the amplifier output transformer no longer works with $R_L = 75$ ohms, but with $R_L = 50$ ohms (see figure 19).

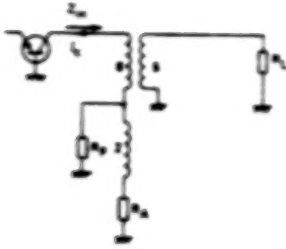


Figure 19.

In order to evaluate it, I note that in the nominal case of $R_L = 75$ ohms, the following results are obtained:

$$Z_{in} = 155 \text{ ohms}, \quad I_C = 84 \text{ mA}$$

and therefore

$$V = Z_{in} \cdot I_C = 12.89 \text{ volts}$$

from which the power at the transformer input, P_O , turns out to be

$$P_O = \frac{V^2}{Z_{in}} = 27.32 \text{ dBm}$$

Moreover, because it is known that the loss on overload of the transformer is 1.24 decibels, the output power on R_L becomes

$$P_{(R_L = 75 \text{ ohms})} = 26 \text{ dBm}$$

If $R_L = 50$ ohms with the same procedure

$$Z_{in} = 114 \text{ ohms}, \quad I_C = 84 \text{ milliamperes} \quad V = Z_{in} \cdot I_C = 9.48 \text{ volts},$$

from which

$$P_O = \frac{V^2}{Z_{in}} = 26 \text{ dBm}$$

Because it is also known that in this case the loss on overload of the transformer is 1.21 dB, the output power on $R_L = 50$ ohms becomes

$$P_{(R_L = 50 \text{ ohms})} = 24.8 \text{ dBm}$$

with an additional loss of 1.2 decibels.

Altogether, failure to match the output and input of the repeaters connected to the underwater cable gives rise to loss of 1.56 decibels on overload.

BIBLIOGRAPHY

1. Bellato, L. and Staffoli, C., "The 60 MHz Coaxial Line System," TELETTRA REVIEW, No. 29.
2. CCITT [International Telegraph and Telephone Consultative Committee] Orange Book, Vol 3-1, Rec. G. 223. pp 132-140, ITU, Geneva, 1977.
3. CCITT Green Book, Vol 3-2, Supplement 9, pp 592-597, ITU, Geneva, 1973.

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